



# Proper Hand-Washing Techniques in Public Restrooms: Differences in Gender, Race, Signage, and Time of Day

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## ABSTRACT

*The purpose of this study was to evaluate hand washing behaviors in public restrooms with and without reminder signs. Gender, race, signage, and time of day were examined to determine if there were differences in hand washing compliance based on these variables. Participants included male and female adults entering restrooms at two public shopping malls in a midwestern city. The total number of observations made was 599. Of those observed, full hand washing compliance (based on CDC guidelines) was accomplished by 190 (31.7%) individuals. Sixty-eight percent either did not wash their hands or washed them in a less effective way. Significant differences were noted in hand washing compliance based on gender and race. Females and non-Caucasians were more likely to wash their hands than were males and Caucasians. No significant differences in hand washing were noted based on signage or time of day.*

The most common way to spread infections is via the hands (Coignard et al., 1998). Thus, hand washing is one of the most effective tools for preventing the spread of infection. Semmelweis, a physician and epidemiologist, first noted the importance of hand washing in the 1800s (Timmreck, 1998). In the United States, however, hand washing rates range from 60%-78% ("Did you wash," 1996).

The transmission of disease through the fecal-oral route poses a serious public health problem. *Escherichia coli* 0157:H7, cholera, typhoid fever, salmonella, cryptosporidiosis, the common cold, shigella, and Hepatitis A are just a few examples of diseases that could be caused by improper hand washing (Timmreck, 1998). Fecal oral disease transmission occurs when microorganisms found in the feces enter the mouth through food, water, or not washing hands after using the

toilet. Key preventive strategies include hygiene education and proper hand washing (Benenson, 1995).

Low hand washing rates have been attributed to lack of knowledge about the importance of hand washing and lack of motivation (Centers for Disease Control and Prevention [CDC], 1985). No published study to date has examined whether hand washing differs based on gender, race, and time of day. Previous studies have not examined hand washing signs to determine their effectiveness. Several studies have examined hand washing campaigns among day care centers. These campaigns include education, activities and hand washing signs (Munger & Harris, 1989).

The present study examined whether hand washing behaviors differ based on these variables. In addition, the effect of hand washing signs in public restrooms on hand washing was investigated. Previous

hand washing reports in the literature had limited observations to only one gender and no studies examining different races could be found. By studying race, gender, the effectiveness of reminder signs, and time variables this study sought information to better direct future hand washing programs and campaigns. Identifying gender or racial differences could provide preliminary evidence to help health educators better focus future hand washing programs in adult populations. Results from this study could also help determine if hand washing signs

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are effective, and if funds should be spent purchasing signs. Examining hand washing rates based on time of day may reveal if people are more likely to wash hands at or around the lunch hour.

## METHODS

### Participants

The participants of this study were male and female adults entering the restrooms at two public shopping malls in a Midwestern city on Saturdays in October 2001 between the hours of 11:00a.m. to 3:00p.m. The researcher or a trained observer made all observations. An adult was defined as anyone who used the bathroom facilities without parental or adult supervision. Anyone needing instruction or assistance to wash hands was not included in this study.

### Instrumentation

After a comprehensive review of the literature on hand washing guidelines, categories of hand washing were developed. Four levels of hand washing were defined. Level four, or full compliance, was defined by CDC guidelines (CDC, 1985), which included washing both hands with soap and rubbing them together to produce lather for 15 seconds. Level three, or partial compliance, was washing both hands with soap for less than 15 seconds. Level two, or minimal compliance, was rinsing both hands with water but no soap. Level one, non-compliance, was simply not washing or rinsing. Hand washing observations were recorded on a spreadsheet developed by the researcher. Sex, race, signage, time and level of hand washing were recorded on the spreadsheet.

To establish interrater reliability, a training/testing session was held prior to the actual data collection. A sample setting for hand washing was established. The setting was a kitchen sink with hand soap, hand towels, and running water. The training included one demonstrator and two observers. One observer, the researcher, was female and would perform all observations in female restrooms. The demonstrator and male observer were given oral and written information on the four levels of hand

washing from the researcher. In addition, the researcher conducted a demonstration of the four levels of hand washing while the demonstrator and male observer watched.

After the training was completed, the demonstrator was instructed to present the four hand washing levels in random order while both observers watched. The demonstrator kept track of the hand washing level being demonstrated on a spreadsheet. The spreadsheet listed the four levels of hand washing with a box next to each level. The demonstrator checked the level of hand washing being presented on the spreadsheet. The researcher and observer watched 10 different hand washing presentations performed by the demonstrator and recorded what level they believed was being demonstrated on separate spreadsheets. Correlations were calculated to compare the spreadsheets of the two observers. Interrater reliability was determined to be .92.

### Procedures

Following approval from the University of Cincinnati Human Subjects Committee, establishment of interobserver reliability, and approval from the researcher's graduate committee, observations were made at two shopping malls in a Midwestern city on Saturdays in October 2001 between 11:00am and 3:00pm. Participants included male and female adults entering the restroom at the specified times. Only individuals using the toilet facilities were included as participants. Individuals entering to wash hands or apply make-up were not included. Signs were displayed from 11:00am-12:00pm and 1:00pm-2:00pm. Signs were removed from 12:00pm-1:00pm and 2:00pm-3:00pm. The signs were displayed on the inside of the stalls in the women's restroom. The signs were displayed above the urinals in the men's restroom. The signs were in color and reminded adults to wash their hands before leaving (Figure 1).

The researcher conducted all observations in restrooms for females and a trained male observer conducted observations of males. Both observers wore college sweatshirts, jeans, and tennis shoes. Each observer carried a shopping bag from one

**Figure 1. Henry the Hand's Hand Washing Instructions**



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of the mall's stores. Clipboards with spreadsheets were concealed in the shopping bags. The observers watched participants, and then entered a stall to record data. While in the restrooms, observers participated in hand washing, used the facilities, applied makeup (female researcher), and pretended to wait for another individual (male researcher). The observers were in view of the sink for all observations. The study assumed that participants did not recognize observers and displayed normal hand washing behaviors. After all observations were made, data was entered into the Statistical Package for the Social Sciences (SPSS) 10.0 software program. Levels of hand washing were given numeric ratings. A four rating was given if individuals properly washed their hands according to CDC guidelines. A three rating was given if individuals washed with soap for less than 15 seconds. A two rating was given if individuals rinsed with water and did not use soap. A one rating was given if individuals did not wash or rinse their hands. Hand sanitizers were not available in restrooms utilized in this study. Thus, use of a hand sanitizer was not taken into consideration.

Chi-square tests were used to determine

**Table 1. Hand Washing Observations and Percentages**

Independent Variable	<i>n</i>	%
Gender		
Men	291	48.6
Women	308	51.4
Presence of Sign		
Yes	307	51.3
No	292	48.7
Hours		
Lunch	267	44.6
Nonlunch	332	55.4
Race		
Caucasians	459	76.6
Non-Caucasians	140	23.4
Level of Hand Washing <sup>A</sup>		
Level 1	112	18.7
Level 2	155	25.9
Level 3	142	23.7
Level 4	190	31.7

Note: *N*=599  
<sup>A</sup>Level 1= not washing or rinsing; Level 2= washing without soap but with water; Level 3= washing both hands with soap for less than 15 seconds; Level 4= washing both hands with soap and rubbing them together to produce lather for 15 seconds

if significant differences existed in hand washing behaviors based on gender, race, and signage, and time. An alpha level of .05 significance was utilized for data analyses.

## RESULTS

In total there were 599 hand washing observations (*n*=599) made in this study. Two hundred and ninety one were of males (48.6%) and 308 were of females (51.4%). There were 459 Caucasians (76.6%) and 140 non-Caucasians (23.3%). There were 307 observations (51.3%) made with hand washing reminder signs posted and 292 observations (48.7%) without hand washing reminder signs posted. There were 267 observations (44.6%) made during lunch hours and 332 observations (55.4%) during non-lunch hours.

The number of participants not washing or rinsing hands, Level 1, were 112 (18.7%). One hundred fifty-five (25.9%)

were at Level 2, washing without soap but with water. One-hundred-forty-two (23.7%) washed with soap but for less than 15 seconds (Level 3). Level 4, full compliance, was accomplished by 190 (31.7%) individuals (Table 1).

Only 31.7% of participants using the toilet facilities during observations washed their hands in a manner that met CDC guidelines. Results indicated that 68.3% either did not wash or washed in a less effective way. More than half (55.4%) washed with soap. This indicates that 44.6% of participants did not use any soap and were at increased risk for contracting, carrying, and spreading disease.

Based on the data in this study, females were more likely than males to wash their hands as recommended after using toilet facilities, and non-Caucasians were more likely than Caucasians to wash their hands as recommended after using the toilet facilities. Individuals were not more likely to wash their hands as recommended if signs were posted, and it was concluded that during lunch times participants were neither more nor less likely to wash their hands as recommended after using the toilet facilities than during non lunch times (Table 2).

## DISCUSSION

In the United States hand washing rates range from only 60-78% ("Did you wash," 1996). An international research firm conducted an observational study in five U.S. cities. The study used "undercover" observers to watch hand washing behaviors in public restrooms. Observations were made at New York City's Penn Station, an Atlanta Braves game, San Francisco's Golden Gate Park, a New Orleans casino, and Chicago's Navy Pier. Results indicated hand washing rates of 60%, 64%, 69%, 71%, and 78%, respectively. The observers did not determine hand washing by levels. Individuals either washed their hands or did not. Hand washing was defined as using soap and water regardless of time. These hand washing rates were higher than the current study, however, if levels of hand washing were collapsed, results are similar. More than half

(55.4%) of participants in the current study washed with soap regardless of time.

Munger and Harris (1989) showed increased hand washing rates while an observer was present. When an observer was present 77% of individuals washed their hands. When an observer was not present 39% of individuals washed their hands (Munger & Harris, 1989). The low rates of hand washing among participants in this study did not support Munger and Harris' findings and may indicate that individuals in this study did not realize they were being observed. This supports our methods and indicates that the rates observed were most likely accurate and not greatly influenced by the observer's presence in the restroom.

While the results of our study were significant and support the need for targeted interventions, there were limitations and further study is needed. This study only examined people using public restrooms at two shopping malls in a midwestern city during a one month period of time. Similar populations should be studied in different geographic areas to confirm these results. In addition different populations should be studied at worksites, religious institutions, schools, sporting events, and so forth. Another limitation is that the study was conducted on weekends. Further research should examine weekdays in comparison with weekends. Another limitation is the presence of observers. Strategies were used to decrease identification of observers. However, presence of an observer is a limitation to this study.

The current study examined hand washing compliance based on race. The only racial categories examined in the study were Caucasian and non-Caucasian. Placing participants into the appropriate racial categories was accomplished solely on visual appearance and errors could have been made in accurately assigning people to racial groups. Further the category non-Caucasian is a large grouping and contained African Americans, Asians, Hispanics, and perhaps others. Future studies should explore ways to further divide non-Caucasians into other racial categories and to confirm racial

**Table 2. Hand Washing Compliance by Gender, Race, Signage, and Time of Day**

	Level 1		Level 2		Level 3		Level 4		Total	
	N	%	N	%	N	%	N	%	N	%
<b>Gender<sup>A</sup></b>										
Male	76	26.1	104	35.7	59	20.3	52	17.9	291	100
Female	36	11.7	51	16.6	83	26.9	139	44.8	308	100
Total	112	18.7	155	25.9	142	23.7	190	31.7	599	100
<b>Race<sup>B</sup></b>										
Caucasian	95	20.7	125	27.2	104	22.7	135	29.4	459	100
Non-Caucasian	17	12.1	30	21.4	38	27.1	55	39.3	140	100
Total	112	18.7	155	25.9	142	23.7	190	31.7	599	100
<b>Signage<sup>C</sup></b>										
With	56	18.2	79	25.7	72	23.5	100	32.6	307	100
Without	56	19.2	76	26	70	24	90	30.8	292	100
Total	112	18.7	155	25.9	142	23.7	190	31.7	599	100
<b>Time of Day<sup>D</sup></b>										
Lunch hour	54	20.2	65	24.3	70	26.2	78	29.2	267	100
Nonlunch hour	58	17.5	90	27.1	72	21.7	112	33.7	332	100
Total	112	18.7	155	25.9	142	23.7	190	31.7	599	100

Note: N=599.

<sup>A</sup>Chi square=74.969; p=.000.

<sup>B</sup>Chi square=9.803; p=.020.

<sup>C</sup>Chi square=.237; p=.971.

<sup>D</sup>Chi square=3.273; p=.351.

classifications. Perhaps conducting interviews after participants leave the rest-room could establish racial categories more accurately.

## CONCLUSIONS AND RECOMMENDATIONS

The results of this study clearly indicate the need for adult programming on the importance of hand washing. Less than one-third (31.7%) of participants washed their hands in a way that would effectively reduce fecal contamination. Health educators in all settings including worksites, community agencies, schools, public health departments, and health care facilities need to develop programs that encourage proper hand washing practices.

The results of this study further indicate that gender and race are both related to hand washing compliance. Females were much more likely to wash hands as recommended after using toilet facilities than males (44.8% vs. 17.9%). This supports the

need for hand washing campaigns directed at adult males. Non-Caucasians were more likely to wash hands as recommended after using toilet facilities than Caucasians (39.3% vs. 29.4%). Further analysis of results indicated that 50.9% of Caucasian males did not wash or simply rinsed their hands with water. The results of this study indicate that Caucasian males are a group in need of programs to increase hand washing compliance.

Based on the results of this study it was concluded that hand washing reminder signs and time of day did not have an impact on hand washing compliance in public restrooms. Only one sign type was used in this study, and it was selected due to its color and brightness. Different signs, however, could be employed in future studies to see if they improve hand washing compliance. The use of focus groups could be employed prior to the study to better determine sign appeal.

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